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A NEW SPECIES OF BREGMACEROTIDAE (PISCES), *BREGMACEROS CANTORI*, FROM THE WESTERN ATLANTIC OCEAN

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ABSTRACT

A new species, *Bregmaceros cantori*, is described from more than 600 juvenile and adult specimens collected from the Cariaco Trench, Venezuela, and the Gulf of Mexico. The species differs markedly from *B. macclellandi* and *B. atlanticus*, as well as from an undescribed species. *Bregmaceros cantori* can be identified based on several morphological, meristic and probable behavioral/ecological characteristics (e.g., eye size, fin ray counts, diurnal vertical migration). The new species is coastal-oceanic in its distribution and superficially resembles Indo-Pacific *B. nectabanus* and *B. rarisquamosus*, from which it differs in meristic characteristics. Larval *B. cantori* are the most common bregmacerotid in the western Atlantic and are easily separated from their congeners and from other species that have been described. *Bregmaceros cantori* from the Cariaco Trench undergoes a diurnal vertical migration in which the adult population spends approximately 11 hours in the anoxic, sulfurous waters of the Trench, a behavior pattern not previously observed in Atlantic *Bregmaceros*.

In April 1969 and May 1971 a well-defined sound scattering layer was observed migrating into and out of the anoxic zone of the Cariaco Trench, Venezuela (Wilson, 1972). Mead (1963) had reported numerous specimens of a codlet, *Bregmaceros atlanticus* Goode and Bean from the trench, but positive identification of specimens collected by Wilson and suspected of being the anoxic zone migrators remained doubtful. Noting that the Cariaco specimens were conspicuously different from the *B. atlanticus* commonly found in the Gulf of Mexico and Caribbean, Baird et al. (1973) tentatively identified the Cariaco fish as *B. nectabanus* Whitley. This identification was based primarily on comparisons with specimens from the eastern Atlantic positively identified by D'Ancona and Cavinato (1965) as that species. We examined the specimens collected in the Trench by Baird et al., Mead, and Wilson and considered that the Cariaco population represented a new species.

Based on ichthyoplankton surveys in the Gulf of Mexico, Houde (1981) reported four types of codlet larvae, two of which were *B. macclellandi* and *B. atlanticus*. His "Type B" larvae, which were the most abundant, are the new species described here. Reports of the occurrences of larval and adult *B. nectabanus* from the Caribbean Sea and Gulf of Mexico (Belyanina, 1974; 1980; Belyanina and Lopes, 1974) appear to be in error. Those reports probably refer to the new species which we describe.

MATERIAL EXAMINED

Bregmaceros cantori is described from 600 specimens collected in the Cariaco Trench by various expeditions. In the course of describing the new species, an additional 1,244 specimens of Atlantic bregmacerids were examined. A complete list of the material, including collection data, is on file with the Department of Marine Science (DMS), University of South Florida. Table 1 contains an abbreviated list of the study material.

All measurements were taken according to Hubbs and Lagler (1947) (Fig. 1). Internal pigment was examined by filleting one side of each specimen from the caudal peduncle to the body cavity.

Table 1. Specimens examined from the Gulf of Mexico, Caribbean and western Atlantic: *Bregmaceros cantori, B. macclellandi* and *B. atlanticus*

Vessel	Cruise No.	Date	Locality	Institution	No. Specimens
Bregmaceros cantori					
RV CHAIN	26	May 1962	Cariaco Trench	MCZ	223 (Mead, 1963)
USNS SANDS		Jan. 1968	Cariaco Trench	NRL	253 (Pugh, 1972)
USNS MIZAR	72-11-01	Mar. 1972	Cariaco Trench	NRL/DMS	124 (Baird et al., 1973)
RV ATLANTIDE		Jan. 1946	Gulf of Guinea	ZMUC	5 (D'Ancona and Cavinato, 1965)
RV GALATHEA		Dec. 1950	Gulf of Guinea	ZMUC	1 (D'Ancona and Cavinato, 1965)
Bregmaceros atlanticus					
RV ATLANTIS II	13	Sept. 1964	WN Atlantic	WHOI	21
	31	Mar. 1967	SW Atlantic	WHOI	5
	49	July 1969	WN Atlantic	WHOI	15
	78	Oct. 1973	Cent. W Atlantic	WHOI	34
	79	Dec. 1973	Caribbean	WHOI	15
RV CHAIN	32	Sept. 1962	W Atlantic	WHOI	16
	49	June 1965	Cent. N Atlantic	WHOI	13
	60	May–June 1966	Gulf of Mexico-Carib.	WHOI	477
Dept. Mar. Sci., Univ. So. Fl.	1–4	1972–1974	E Gulf of Mexico	DMS	87
Bregmaceros macclellandi					
RV ATLANTIS II	13	Sept. 1964	WN Atlantic	WHOI	4
	49	July 1969	WN Atlantic	WHOI	22
	78	Oct. 1973	Cent. W Atlantic	WHOI	123
	79	Dec. 1973	Caribbean	WHOI	15
RV CHAIN	35	Feb. 1963	SW Atlantic	WHOI	17
	60	May–June 1966	Gulf of Mexico-Carib.	WHOI	374
	85	Dec. 1968	W Atlantic	WHOI	6
Dept. Mar. Sci., Univ. So. Fl.	1–4	1972–1974	E Gulf of Mexico	DMS	24

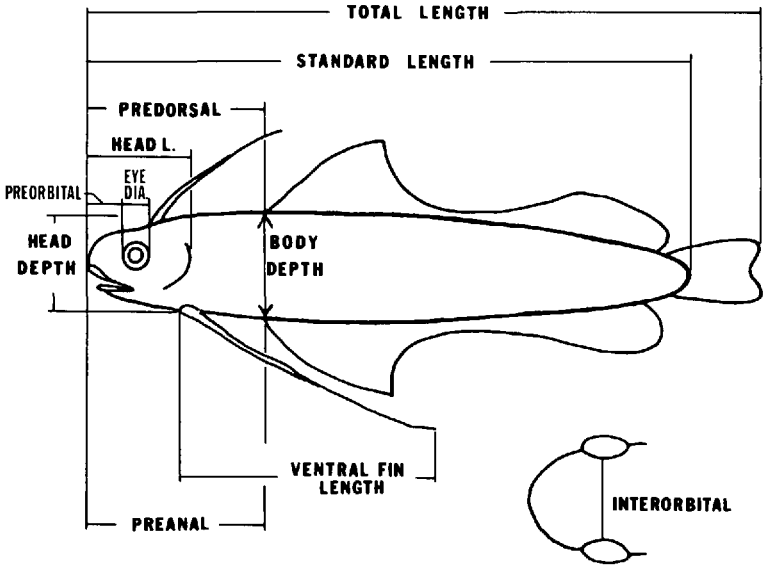

Figure 1. Morphometric measurements.

Bregmaceros cantori new species
(Figures 2 and 3, Table 2)

Bregmaceros atlanticus, Mead (not Goode and Bean, 1886), 1963, 1963: 251–257; Pugh, 1972: 214–228.

Bregmaceros nectabanus, D'Ancona and Cavinato (in part) (not Whitley, 1941), 1965: 47; Baird et al., 1973: 503–504.

Bregmaceros sp., Wilson, 1972: 168–176.

Holotype.—One specimen, 35.8 mm SL, USNS MIZAR, cruise 72-11-01, 10°38'N, 65°45'W (Cariaco Trench), 8 March 1972, 1610 to 1823 h, 450–475 m, 1.8 × 1.8 m modified Tucker Trawl; MCZ 50095.

Paratypes.—Ten specimens, 31.1–34.4 mm SL, data as for holotype, MCZ (uncatalogued); six specimens, 33.3–33.6 mm SL, data as for holotype, Zoological Museum, Copenhagen (ZMUC) (uncatalogued); three specimens 33.4–33.7 mm SL, data as for holotype, USNM (uncatalogued).

Diagnosis.—*B. cantori* is conspicuously different from its two described western Atlantic congeners (*B. atlanticus, B. macclellandi*) by virtue of lower median fin ray (D. 45–48, A. 45–49) and vertebral counts (45–48), narrower interorbital region (4.0–6.7 in head length), shorter blunter snout (1.0–2.4 in eye) and unique external and internal pigmentation (Fig. 4). *Bregmaceros cantori* differs from a fourth, undescribed species that occurs in the western Atlantic (the "Type A" of Houde, 1981 and in press) based on distinctive larval morphology and pigment characteristics and on its higher dorsal and anal fin ray counts.

The new species appears to be morphologically similar to another species, *B. nectabanus,* but differs from that species by having fewer vertebral elements and transverse scales (10–12), a deeper head (5.5–8.2 in SL), blunter snout, narrower interorbital, and distinct leaf shaped internal pigment pattern.

Bregmaceros cantori differs from *B. rarisquamosus* which it superficially resembles by having higher dorsal and anal fin ray counts, narrower interorbital, smaller eye (2.3–4.8 in head) and shorter snout, different alignment of dorsal and anal fin insertions, and a leaf shaped internal pigment pattern.

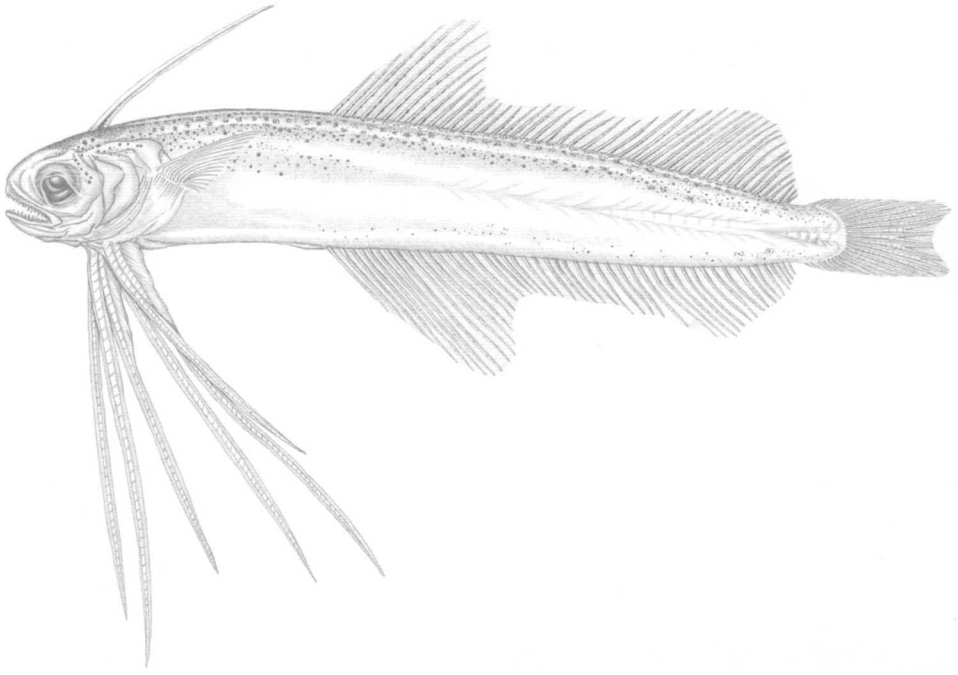

Figure 2. *Bregmaceros cantori,* 37.4-mm SL from the Cariaco Trench (drawing by James Seagle).

Description.—D. 45–48, A. 45–49, P. 13–16, vertebrae 45–48, transverse scales 10–12 (usually 11), gill rakers reduced to tooth-like projections evenly scattered on gill arches.

Body depth 5.5–7.2, head length 5.1–6.4 in SL; interorbital narrow 4.0–6.7 in head length, 3.1–5.4 in head depth, sub-equal to half diameter of eye; snout short, blunt and rounded, about half eye diameter, eye moderately large, about ½–⅕ head length, partially covered by transparent membrane. Dorsal fin inserted in line with anal fin, posterior rays of anal fin slightly longer than posterior rays of dorsal fin. Maxillary short, reaching just past midline of pupil.

Sides of body colorless, nearly transparent in live or fresh specimens, whitish yellow or beige in preserved material. Line of brown pigment extending from postero-dorsal margin of opercle to base of caudal fin and dorsal to midline, merging with diffuse scatter of brown chromatophores from base of posterior third of dorsal fin and extending onto rays; other fins colorless. Secondary line of chromatophores at base of dorsal fin extending onto head forming figure-eight patch on head between occipital ray and point above eye about midway through pupil. Interorbital unpigmented; diffuse pigment on snout forming indistinct patch antero-dorsal to eye. Lower jaw colorless. Single pigment spot at angle of jaw in individuals from 2 to about 26 mm SL; not evident in larger individuals.

Internal pigment concentrated on vertebral column from head to hypural; pattern expands posteriorly at point below mid-section of dorsal fin into unsymmetrical, caudally directed, leaf shaped patch (Fig. 4). Shorter line of chromatophores extend ventral to vertebral column from caudal base to posterior section of anal fin. Pigment around caudal vertebrae usually visible externally in fresh specimens and sometimes in preserved specimens 10- to 20-mm SL.

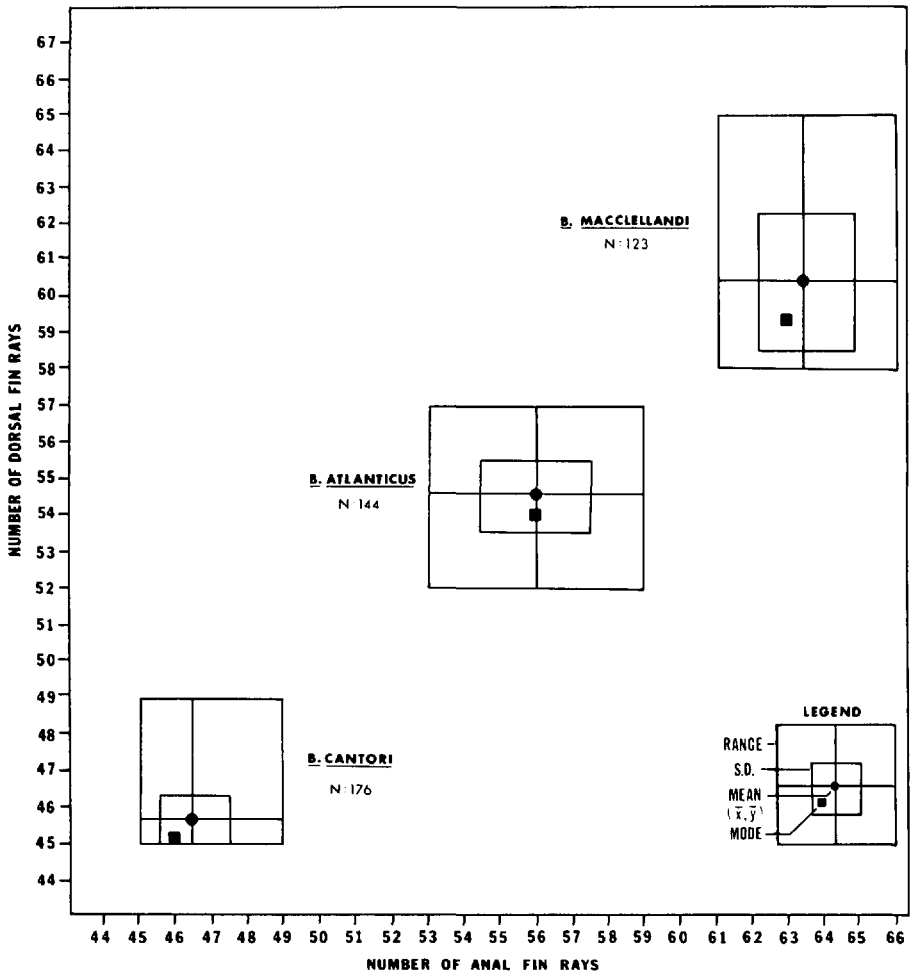

Figure 3. Distribution of dorsal and anal fin ray counts.

Juveniles.—Twelve individuals from 10.4- to 23.9-mm SL differed morphometrically from larger specimens. Body and head depth in these individuals is less than in adult forms, 7.2–9.5 and 7.8–10.4 respectively in SL. Other measured characters conform to the adult forms except for the presence of the single jaw melanophore noted above which is conspicuous in small juveniles but absent in adults.

Larvae.—Specimens from 1.5- to 10.0-mm SL are lightly pigmented. The jaw angle melanophore is present and most larvae ≤mm have a few melanophores on the ventral surface of the visceral mass. Larvae of 5 to 10 mm lose the visceral mass pigment but a large melanophore often is present over the forebrain. Internal pigment on the dorsal surface of the visceral mass is present in all larvae. Internal melanophores also are present near the otoliths, immediately anterior to pectoral fin insertion and along the developing vertebral column in 5- to 10-mm larvae. The occipital ray develops at 6- to 7-mm SL. Houde (in press) has illustrated *B.*

Table 2. Means, ranges, and variance of morphometric and meristic characters for the three described species of *Bregmaceros* in the western Atlantic

	*B. macclellandi** (N = 123)			*B. atlanticus*† (N = 144)			*B. cantori*‡ (N = 176)		
	$\bar{x}$	Range	σ^2	$\bar{x}$	Range	σ^2	$\bar{x}$	Range	σ^2
Std. length: Body depth	7.4	6.1–8.4	0.507	7.5	7.0–9.1	0.158	6.5	5.5–7.2	0.141
Std. length: Head depth	8.8	8.1–9.4	0.104	8.7	8.1–9.3	0.149	7.4	5.5–8.2	0.183
Std. length: Head length	6.4	6.1–6.9	0.073	6.2	5.7–6.7	0.078	5.7	5.1–6.4	0.154
Std. length: Preanal	2.9	2.8–3.3	0.018	2.7	2.6–2.9	0.009	2.6	2.4–2.8	0.011
Std. length: Predorsal	2.6	2.4–2.8	0.011	2.6	2.5–2.8	0.019	2.5	2.3–2.7	0.009
Head length: Eye diam.	4.7	3.0–6.0	0.536	4.2	3.8–5.0	0.142	3.2	2.3–4.8	0.141
Head depth: Interorbital	2.4	1.8–3.3	0.140	3.2	2.6–3.6	0.081	4.1	3.1–5.4	0.237
Predorsal: Preanal	1.1	1.0–1.2	0.004	1.0	1.0	0	1.0	1.0–1.1	0.007
Transverse Scales	13	12–14		12	11–13		11	10–12	
Std. length:		24.4–77.3			24.0–72.3			23.9–57.1	
DIAGNOSTIC CHARACTERS									
Eye diam.: Preorbital	0.8	0.7–1.0	0.005	1.2	1.0–1.3	0.006	1.7	1.0–2.4	0.056
Eye diam.: Interorbital	0.7	0.5–0.9	0.015	1.1	0.9–1.2	0.009	1.8	1.2–2.1	0.061
Head length: Interorbital	3.3	2.4–4.8	0.320	4.5	3.9–5.0	0.088	5.5	4.0–6.7	0.391
Dorsal fin:	60	61–65	1.8	54	51–57	1.1	46	45–48	0.5
Anal fin:	63	59–65	1.2	55	53–57	1.4	47	45–49	0.8
Vertebrae	—	54–55		—	52–53		—	45–48	

* External pigmentation: Body darkly pigmented dorsally, lightening ventrally, dorsal, caudal and pectoral fins dusky. Internal pigmentation: Confined to separate, expanded chromatophores on either side of vertebral column.
† External pigmentation: Body uniformly covered with greyish-brown chromatophores. Internal pigmentation: Straight line dorsal to but contact with the vertebral column.
‡ External pigmentation: Sides of body colorless (white to beige in preservative). Rows of brown chromatophores along dorsal surface. Internal pigmentation: Concentrated in a line along vertebral column expanding posteriorly into a lanceolate pattern pointing posteriorly.

cantori larvae and presented a detailed description of them and other *Bregmaceros* larvae.

Size.—The largest specimen examined measured 57.1-mm SL. *Bregmaceros cantori* appears to mature at a relatively small size; individuals greater than 28-mm SL had mature reproductive organs.

Range.—*Bregmaceros cantori* is abundant in the waters of the Cariaco Trench off Venezuela, but has not been captured beyond the trench sill in the open water of the Caribbean. Several adults were collected from the northern Gulf of Mexico west of the Mississippi Delta and off Yucatan at the Gulf of Campeche. Larvae occur in the Gulf of Mexico, Caribbean Sea, along the United States' coast from the Carolinas to Florida, and off the coast of Brazil. The species may occur in the eastern Atlantic, based on six specimens from the west coast of Africa in the Gulf of Guinea (D'Ancona and Cavinato, 1965) and on larvae that bear strong resemblance to western Atlantic *B. cantori.*

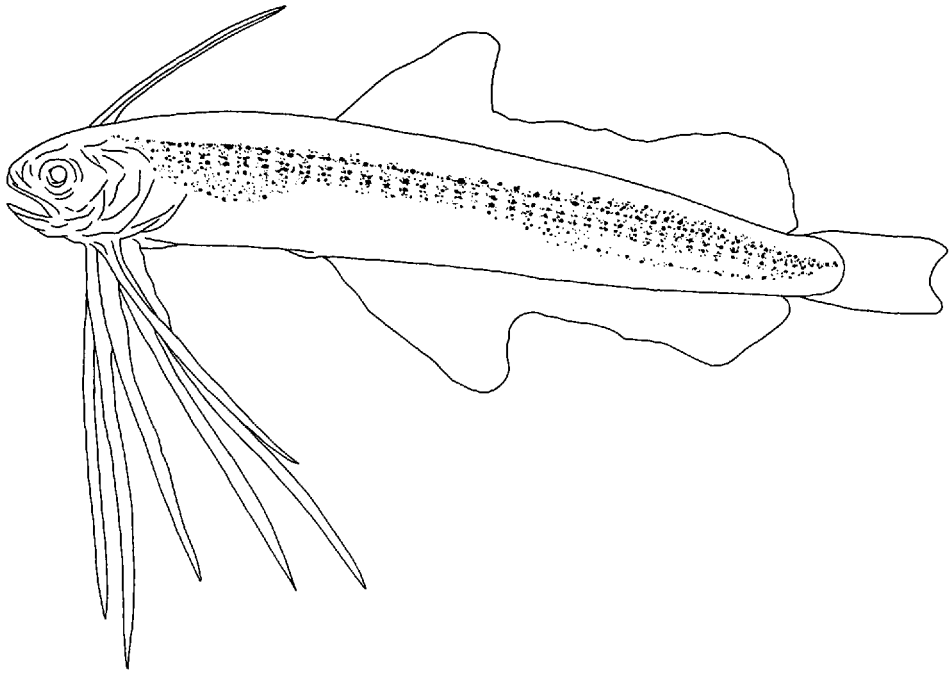

Figure 4. *Bregmaceros cantori,* internal pigmentation pattern (drawing by James Seagle).

Etymology.—Cantori, a noun in the genitive case; named in honor of Dr. Theodore Edward Cantor who discovered the genus *Bregmaceros* and first described *B. macclellandi,* but died before his manuscript could be published.

Holotype Measurements.—35.8-mm SL; body depth 6.3 mm; head depth 5.4 mm; head length 6.5 mm; predorsal distance 15.7 mm; preanal distance 14.4 mm; eye diameter 1.3 mm; anal fin rays 47; dorsal fin rays 46.

Discussion

On the basis of published descriptions (Thompson, 1840; Goode and Bean, 1886; Whitley, 1941; Munro, 1950; D'Ancona and Cavinato, 1965; Belyanina, 1974) it appears that *B. cantori* more closely resembles *B. rarisquamosus* and *B. nectabanus* than either of its confirmed congeners in the Gulf of Mexico or Caribbean. Indeed, *B. cantori* shows much greater morphological divergence from *B. atlanticus* and *B. macclellandi* than either of those species do from each other (Table 2 and Fig. 3). Houde (1981, in press) described a larva, termed "Type A," that is an undescribed species of codlet from the western Atlantic. Larvae and juveniles of the "Type A" differ from *B. cantori, B. macclellandi* and *B. atlanticus* in having lower meristic complements. They also differ substantially in pigmentation characteristics and the size at which the occipital ray develops. They cannot be confused with the three described species.

Belyanina and Lopes (1974) reported 41 specimens of *B. nectabanus,* primarily larvae, collected at the eastern edge of the Cariaco Trench just north of the Araya Peninsula, Venezuela. Their identification of these specimens and a subsequent report by Belyanina (1980) were partially based on the report of that species in

the Cariaco by Baird et al. (1973). The meristic counts and description of the pigmentation conform to those presented here for *B. cantori.* It appears likely that the specimens to which Belyanina and Lopes (1974) and Belyanina (1980) refer are actually *B. cantori.* Examination of additional eastern Atlantic specimens is needed to clarify the status of *B. nectabanus* in the Atlantic.

Nichols (1952) described a species of *Bregmaceros, B. cayorum,* from a single individual collected in the Florida Straits. D'Ancona and Cavinato (1965) tentatively synonymized this species with *B. macclellandi.* Based on examination of the holotype, dorsal and anal fin ray counts were 52 and 54, respectively, and there were 50 vertebral elements. Although the individual is pale and superficially resembles *B. cantori,* it can be assigned to *B. atlanticus* on the basis of meristic and morphometric measurements. Dawson (1966) collected 158 codlet specimens (4.1- to 40.4-mm SL) from shelf waters of the northern Gulf of Mexico, which he reported as *B. atlanticus.* It is highly probable that these individuals are *B. cantori,* based upon their occurrence in the shallow shelf zone.

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